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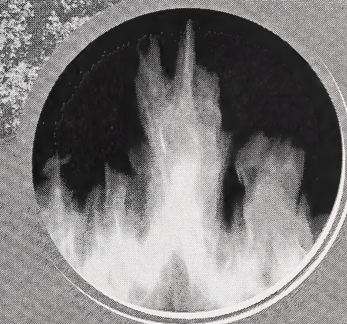
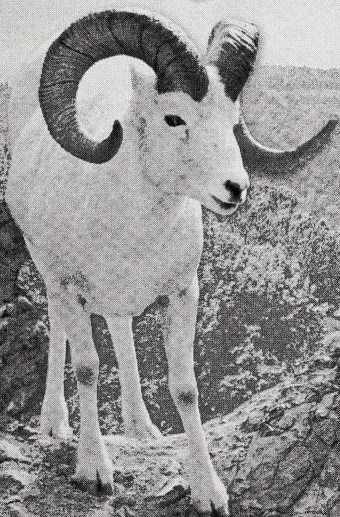
# SCIENCE 9

Module

5

## Space Exploration

*Home Instructor's Guide  
and Assignment Booklet 5B*



Learning  
Technologies  
Branch

Alberta  
LEARNING

Science 9  
Module 5: Space Exploration  
Home Instructor's Guide and Assignment Booklet 5B  
Learning Technologies Branch  
ISBN 0-7741-2600-0

Cover Art: middle right: Corbis  
remainder: PhotoDisc Collection/Getty Images

**The Learning Technologies Branch acknowledges with appreciation the Alberta Distance Learning Centre and Pembina Hills Regional Division No. 7 for their review of this Home Instructor's Guide and Assignment Booklet.**

This document is intended for	
Students	✓
Teachers	✓
Administrators	
Home Instructors	✓
General Public	
Other	



You may find the following Internet sites useful:

- Alberta Learning, <http://www.learning.gov.ab.ca>
- Learning Technologies Branch, <http://www.learning.gov.ab.ca/ltb>
- Learning Resources Centre, <http://www.lrc.learning.gov.ab.ca>

The use of the Internet is optional. Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

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**THIS COURSEWARE IS NOT SUBJECT TO THE TERMS OF A LICENCE FROM A COLLECTIVE OR LICENSING BODY.**

### Section 3: Satellites and Spacecraft

In this module the student focuses on the growth of astronomy. Astronomy started with observations using the naked eye. Today, the exploration of space is done with the use of the entire electromagnetic spectrum. Spacecraft are used to gather data about the universe. The student relates the ability to “see” farther and better to an improved understanding of the solar system and the universe. The student also considers the development of human space exploration, along with the spinoff benefits of space-exploration technology to life on Earth.

No extra materials will be needed to complete this section.

### Suggested Answers

#### Section 3: Lesson 4

Textbook questions 1, 5, 7, and 8 from “Wrap-up: Topics 6 to 8,” page 429:

1. The descriptions in column A line up with the terms in column B.

A	B
planets with gaseous composition	outer planets
an orbit a few hundred kilometres above the ground	low Earth orbit
has taken the place of photographic plates for telescopes	CCD (charge coupled device)
an orbit that takes 24 h to circle Earth	geosynchronous orbit
the nearly weightless conditions in orbit	microgravity
a stream of charged particles coming from the Sun	solar wind
a fleet of satellites used to locate things on Earth	global positioning system
a space flight that goes only part way around Earth	suborbital
planets with terrestrial composition	inner planets
a device that uses the controlled burn of a fuel to propel itself directly upward	rocket
a method of acceleration that uses gravity	gravitational assist
5. Computers are used for planning trajectories, communication, calculations, and motion control, as well as for storing and compiling data.	
7. New medicines and new materials, such as alloys, may be developed on the space station.	
8. The military use GPS for navigation, fishers mark good fishing holes, pilots track their airplane’s position, while trucking firms and railroads use it to track trucks and trains.	

## Module Review

Textbook questions 1, 2, 5, 8, 13, 18, 20, 26, and 28 on “Unit 5 Review,” pages 435 to 437:

1. Ancient astronomers noted that the planets moved relative to the stars, which appeared to be fixed relative to one another. Stars twinkle—planets don’t.
2. Ancient astronomers accounted for day and night by believing that the Sun and all objects in the sky revolve around Earth. Copernicus accounted for day and night by suggesting that Earth’s rotation makes things appear to move around Earth.
5. The Sun’s gravitational pull and the tendency of the planets to move in a straight line combine to keep them in orbit.
8. Adaptive optics has nearly eliminated the twinkling of stars when viewing them through telescopes.
13. Astronomers use computers to store data, link more than one telescope together to improve the resolution, as well as producing and enhancing images.
18. White light passing through a prism is refracted into all colours.
20. Waves from an approaching source appear compressed to an observer and stretched when the source is receding. When a star’s absorption spectrum is viewed from Earth, it appears shifted toward the long wavelength end of the spectrum—the red end—if it is moving away and blue-shifted when it approaches. The greater the shift, the greater the speed.
26. Rocket technology is one example of technology that was developed for war and then used for peaceful purposes. In wartime, people more readily accept huge developmental costs. Once the technology is developed, manufacturers look for new applications to maintain its usefulness.
28. Although answers will vary, students should address the need for food, air, water, and a habitable environment. The psychological needs of humans may well be of the greatest concern for long-term missions.

# ASSIGNMENT BOOKLET 5B

Science 9

Module 5: Section 3 Assignment and Final Module Assignment

Home Instructor's and Student's Comments:

**STUDENT FILE NUMBER**

(if label is missing or incorrect)

Date Submitted:

Apply Module Label Here

Name

Address

Postal Code

Please verify that preprinted label is for  
correct course and module.

**FOR SCHOOL USE ONLY**

Assigned Teacher:

Date Assignment Received:

Grading:

Teacher's Comments

Teacher's Signature

Home Instructor: Keep this sheet when it is returned to you as a record of the student's progress.

# INSTRUCTIONS FOR SUBMITTING THIS DISTANCE LEARNING ASSIGNMENT BOOKLET

When you are registered for distance learning courses, you are expected to regularly submit completed assignments for correction. Try to submit each Assignment Booklet as soon as you complete it. Do not submit more than one Assignment Booklet in one subject at the same time. Before submitting your Assignment Booklet, please check the following:

- Are all the assignments completed? If not, explain why.
- Has your work been reread to ensure accuracy in spelling and details?
- Is the booklet cover filled out and the correct module label attached?

## MAILING

1. Do **not** enclose letters with your Assignment Booklets. **Send all letters in a separate envelope.**
2. Put your Assignment Booklet in an envelope and take it to the post office and have it weighed. Attach **sufficient postage** and seal the envelope.

## FAXING

1. Assignment Booklets may be faxed to the school with which you are registered. Contact your teacher for the appropriate fax number.
2. All faxing costs are the responsibility of the sender.

## E-MAILING

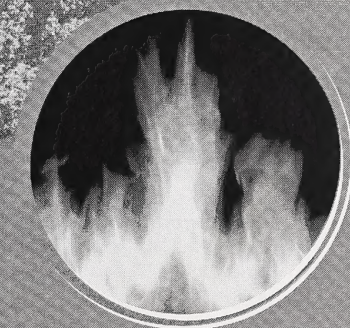
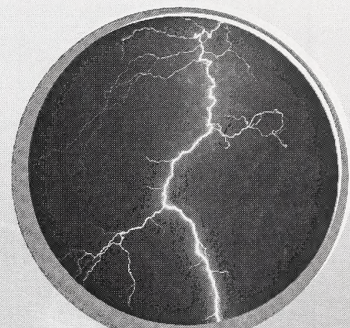
It may be possible to e-mail your completed Assignment Booklet to the school with which you are registered. Contact your teacher for the appropriate e-mail address.

# SCIENCE 9

Module

5

## Space Exploration *Assignment Booklet 5B*



Learning  
Technologies  
Branch

Alberta  
LEARNING

## FOR TEACHER'S USE ONLY

### Summary

	Total Possible Marks	Your Mark
Section 3 Assignment	33	
Final Module Assignment	52	
	85	

### Teacher's Comments

Science 9

Module 5: Space Exploration

Assignment Booklet 5B

Section 3 Assignment and Final Module Assignment

Learning Technologies Branch

**The Learning Technologies Branch acknowledges with appreciation the Alberta Distance Learning Centre and Pembina Hills Regional Division No. 7 for their review of this Assignment Booklet.**

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**ASSIGNMENT BOOKLET 5B**  
**SCIENCE 9: MODULE 5**  
**SECTION 3 ASSIGNMENT AND FINAL MODULE ASSIGNMENT**

Your mark for this module will be determined by how well you do your assignments.

This Assignment Booklet is worth 85 marks out of the total 172 marks for the assignments in Module 5. The value of each assignment and each question is stated in the left margin.

Work slowly and carefully. If you have difficulty, go back and review the appropriate topic.

Be sure to proofread your answers carefully.

33

**Section 3 Assignment: Satellites and Spacecraft**

**Read all parts of your assignment carefully and record your answers in the appropriate places.**

2

1. Is the Moon in a geosynchronous orbit? Explain how you can know the answer to this question from direct observations of the Moon.

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4

2. How can you tell if a satellite dish is tracking a satellite in a low-Earth orbit or a geosynchronous orbit? Explain.

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2

3. A telephone company is considering the placement of satellites in orbit to create a worldwide telephone link. Provide one pro and one con for choosing to use a low-Earth orbit.

**pro** \_\_\_\_\_

\_\_\_\_\_

**con** \_\_\_\_\_

\_\_\_\_\_

- ① 4. Travelling directly to distant destinations in the solar system requires too much power and fuel for present-day spacecraft technology. What method is currently used to help spacecraft gain enough kinetic energy to reach faraway planets?

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- ③ 5. Spinoff technologies are those produced in addition to the principal, intended technology. The spinoff technologies are used in different or new ways.

Explain how the global positioning system (GPS) involves spinoff technologies that benefit the general public.

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Return to page 46 of the Student Module Booklet and continue with Lesson 2.



6. Pictures of the Moon reveal its surface characteristics. Study the pictures of a variety of moons on pages 410 and 418 of the textbook.

a. Suggest a reason for their pitted surfaces.

① 

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b. What historical information can be inferred from the cratering?

① 

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- ② 7. Venus is hotter than Mercury even though Venus is farther from the Sun. Explain.

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4

8. List four ways in which Mars and Earth are similar.

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

Return to page 50 of the Student Module Booklet and continue with Lesson 3.

9. You perform everyday activities on Earth. Astronauts must perform similar activities when they are in outer space. But conditions are different in spacecraft. Adapting these activities to conditions in outer space requires problem solving.

1

a. Problem: Name an everyday activity that would be difficult—but possible—to do in a spacecraft’s microgravity environment.

\_\_\_\_\_

1

b. Solution: How could the problem be overcome? Be specific.

\_\_\_\_\_

\_\_\_\_\_

2

10. After a crew of the International Space Station (ISS) returned to Earth on a Russian Soyuz capsule on May 1, 2004, they were given a red-carpet welcome and dressed in traditional Kazakh robes for the occasion.

For people in orbit aboard the space shuttle, wearing tight-fitting clothes is more practical than wearing flowing, loose-fitting garments. Explain why.

\_\_\_\_\_

\_\_\_\_\_

5

11. List five important, specific, problems that must be planned for if people are ever to make the trip to Mars.

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

- ④ 12. List four specific ways in which Canadians have contributed to space technologies and the space program.
- \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_

Return to page 56 of the Student Module Booklet and continue with the Module Summary.

## 52

### Final Module Assignment

Read all parts of your assignment carefully and record your answers in the appropriate places.



1. Refer to the spectrums on page 435 of the textbook. What can you infer about the motion of stars A and B? Give reasons for your inferences.

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⑤

①

2. Why are diffraction gratings more useful in spectrosopes than prisms are?

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3. Refer to the diagram of objects in the sky from question 21 on page 436 of the textbook. What are the altitudes and azimuths of stars X and Y?

Star X: altitude = \_\_\_\_\_

azimuth = \_\_\_\_\_

Star Y: altitude = \_\_\_\_\_

azimuth = \_\_\_\_\_

④



4. Refer to the spectra from question 22 on page 436 of the textbook. List the element or elements present in each star.

Star A: \_\_\_\_\_

Star B: \_\_\_\_\_

Star C: \_\_\_\_\_

Star D: \_\_\_\_\_

6



5. Refer to the triangulation diagram from question 23 on page 436 of the textbook. Use a labelled scale diagram to determine the distance to the tree. Note that the textbook diagram is not drawn to scale.

7

- ① 6. Suggest a reason why Canada became the first nation to launch a geosynchronous communications satellite.

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7. A frame of reference must be used to describe position or motion.

- ① a. Did ancient people have a heliocentric or a geocentric frame of reference for viewing celestial bodies?

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- ① b. Explain why ancient people used this frame of reference.

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- ② 8. In a science-fiction story, a television entrepreneur is promoting a television station to broadcast news to Earth from an Earth-like planet near the Alpha Centauri star system. Alpha Centauri is 4.35 light-years from Earth. Explain why, using current technology, this is an unreasonable plot.

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- ③ 9. Voyager 2 was travelling at 10 km/s when it left the solar system. The spaceship was heading toward Sirius, which is a star 8.7 light-years from Earth. Assuming Voyager 2 remains intact and on course, calculate how many years it will take Voyager 2 to reach Sirius. Show all your work in determining the length of time for the one-way trip.

②

10. You are a member of a team charged with placing a satellite into orbit. The satellite is designed to assist in producing detailed maps of Alberta. Your task is to recommend the type of orbit to be used. What is your decision? Explain.

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②

11. On a live, local news broadcast the host talks to a reporter in Melbourne, Australia. You notice that the reporter seems to be slow with his answers. What is the technological explanation for this time-lag?

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③

12. Identify three major factors that influence decisions about space exploration and development.

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

13. Use the following list of expressions and terms to fill in the blanks.

absorption	conservation law	law of gravity
adaptive optics	Doppler effect	light
aerial photography	electromagnetic waves	planets
asteroids	elliptical	reflecting
AU	emission	refracting
charge coupled devices	fibre optics	remote sensing
circular	interferometry	stage

Complete the following statements. Not all the listed expressions and terms are to be used.

①

- a. The planets move in \_\_\_\_\_ orbits around the Sun.

①

- b. The technology that uses computers to compensate for atmospheric distortion of telescope images is called \_\_\_\_\_.

①

- c. \_\_\_\_\_ convert light signals into digitally formatted electrical signals.

- ① d. Based on their observations of the motions of celestial objects, the ancient Greeks classified five bodies as \_\_\_\_\_. This name comes from their word for “wanderer.”
- ① e. A section of a rocket that drops off when it is no longer needed is referred to as a(n) \_\_\_\_\_.
- ④ f. \_\_\_\_\_ telescopes have an objective mirror rather than a lens. They use \_\_\_\_\_ to produce an image. Radio telescopes use \_\_\_\_\_ to form an image. Radio telescopes can be connected to produce more accurate images using the \_\_\_\_\_ method.
- ① g. Newton’s \_\_\_\_\_ helps explain why satellites can be put into orbit around the Earth.
- ① h. When a gas is heated in a thin glass tube, it should produce a (an) \_\_\_\_\_ spectrum.
- ① i. The changes in the sound of a jet plane flying over as you rest in the grass is referred to as the \_\_\_\_\_.
- ① j. Suppose you travelled to the Sun and back to Earth again. Then the distance you would have travelled would be 2.0 \_\_\_\_\_.
- ① k. A method of collecting information by using instruments from far off in space is called \_\_\_\_\_. This method is used to map land use, track weather, and detect environmental damage.

## ASSIGNMENT BOOKLET DECLARATIONS

The school you are registered with may require you to submit this signed form with your Assignment Booklet.

The Student's Declaration is to be signed by the student. If the student is under 16, the Supervisor's Declaration may need to be signed by the supervisor, who is usually a home instructor, teacher, or home-schooling coordinator. Failure to complete this page may invalidate the assignment results. Please contact your school and ask if this completed form is required.

### STUDENT'S DECLARATION

- I have followed the instructions outlined in the Student Module Booklet.
- I have completed the activities to prepare myself for the assignments in this Assignment Booklet.
- I completed the assignments in this Assignment Booklet by myself.

\_\_\_\_\_  
Student's Signature

### SUPERVISOR'S DECLARATION

I hereby certify that I have supervised the learning activities completed by \_\_\_\_\_.  
Student's Name

I also certify that to the best of my knowledge the assignments in this Assignment Booklet were completed independently by this student.

\_\_\_\_\_  
Supervisor's Signature

If you, the student or supervisor, have any comments or observations regarding this module, write them in the following space.

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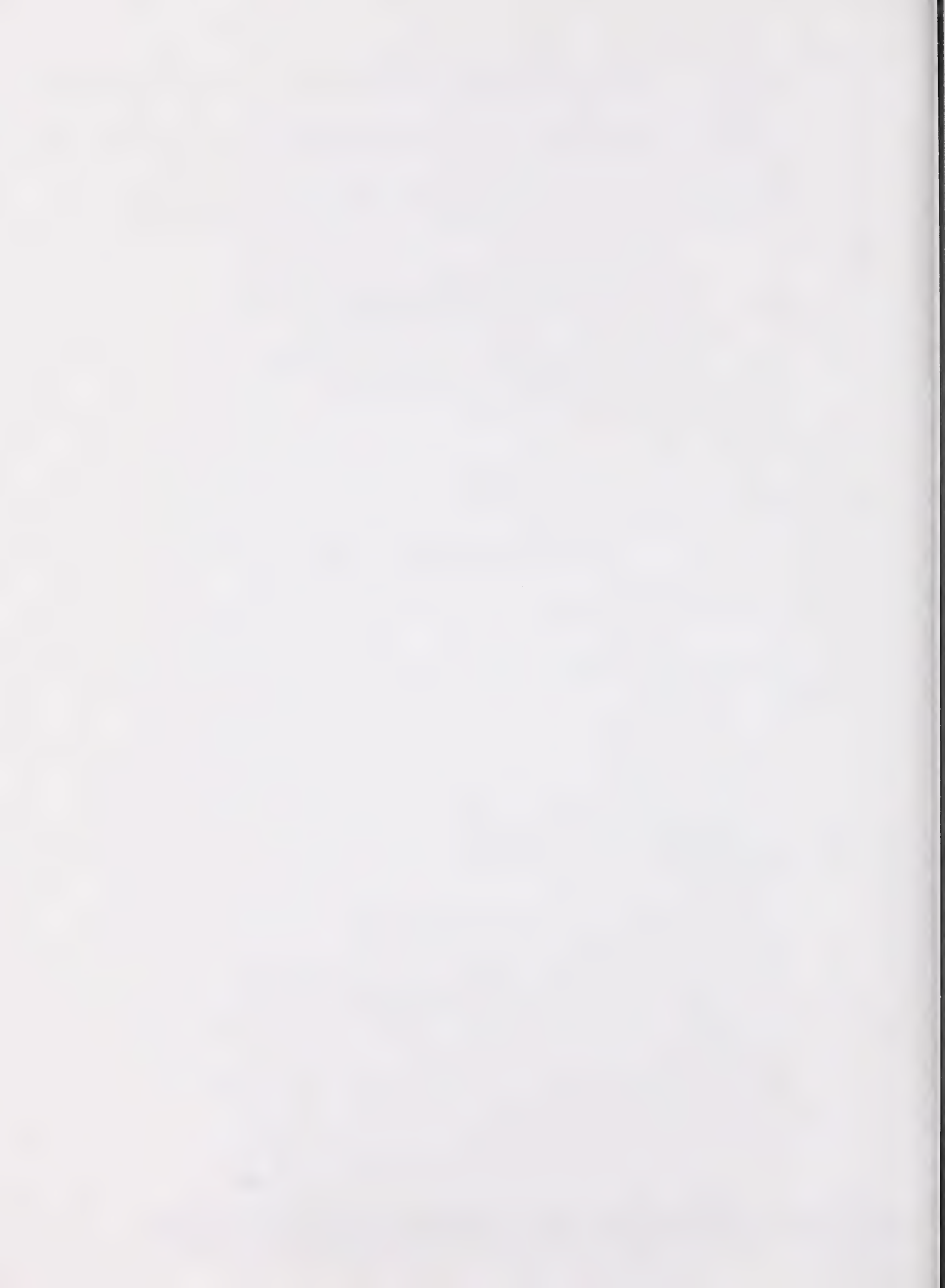
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## LEARNING TECHNOLOGIES BRANCH DISTANCE LEARNING STUDENT COURSE SURVEY

*After you have completed the assignments in this course, please fill out this survey. Your constructive comments will be greatly appreciated, as future course revisions can then incorporate any necessary improvements.*

*We encourage you to go to our website at [www.learning.gov.ab.ca/lrb](http://www.learning.gov.ab.ca/lrb) and complete and submit this survey electronically. If this is not possible, see the last page of the survey for other ways to submit the survey.*

Age (optional): ☐ under 19      ☐ 19 to 40      ☐ over 40

School Where You Are Registered to Take This Course: \_\_\_\_\_

Course Name: \_\_\_\_\_ Date: \_\_\_\_\_

Course Copyright Year (See back cover.) \_\_\_\_\_

### Design

1. The recommended process for students is to work through the Student Module Booklet(s) as instructed and then complete the assignments when directed. Did you follow this process?

☐ Yes      ☐ No      If no, explain.

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2. The Student Module Booklet(s) contains a variety of self-assessed activities. Did you find it helpful to be able to check your work and have immediate feedback?

☐ Yes      ☐ No      If yes, explain.

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3. Were the questions and directions in the Student Module Booklet(s) easy to understand?

☐ Yes    ☐ No    If no, explain.

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4. Did you understand what was expected in the Assignment Booklets?

☐ Yes    ☐ No    If no, explain.

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5. The course materials were designed to be completed by students working independently. Were you always aware of what you had to do?

☐ Yes    ☐ No    If no, provide details.

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6. This distance learning course may have included an assortment of drawings, photographs, and charts.

a. Did you find the visuals in this course helpful?

☐ Yes    ☐ No    Comment on the lines below.

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b. Did you find the variety of visuals in this course motivating?

☐ Yes    ☐ No    Comment on the lines below.

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7. Suggestions for Internet use may be included in the course. Were these suggestions helpful?

☐ Yes    ☐ No    Comment on the lines below.

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8. Some activities may have called for the use of a course or textbook CD. Did you use such resources as instructed?

☐ Yes    ☐ No    Comment on the lines below.

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9. How did you submit your assignments?

☐ mail    ☐ fax    ☐ e-mail    ☐ drop off

10. The Student Module Booklet(s) may have directed you to work with your teacher or to consult with your teacher if you were having problems. How well did you work as a team?

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## Course Content

1. Was enough detailed information provided to help you learn the expected skills and objectives?

☐ Yes    ☐ No    Comment on the lines below.

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2. Did you find the workload reasonable?

☐ Yes    ☐ No    If no, explain.

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3. Did you have any difficulty with the reading level?

☐ Yes    ☐ No    Please comment.

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4. How would you assess your general reading level?

☐ poor reader    ☐ average reader    ☐ good reader

5. Was the material presented clearly and with sufficient depth?

☐ Yes    ☐ No    If no, explain.

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6. Was a textbook required for the course?

☐ Yes    ☐ No    If yes, explain where you got it. Did you have any problem getting it?

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## General

1. What did you like least about the course?

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2. What did you like most about the course?

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### Additional Comments

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**Only students enrolled with the Alberta Distance Learning Centre need to complete the remaining questions.**

1. Did you contact the Alberta Distance Learning Centre for help or information while doing your course?

☐ Yes    ☐ No    If yes, approximately how many times? \_\_\_\_\_

Did you find the staff helpful?

☐ Yes    ☐ No    If no, explain.

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2. Were you able to fax or e-mail any of your assignment response pages?

☐ Yes    ☐ No    If yes, comment on the value of being able to do this.

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3. If you mailed your assignment response pages, how long did it take for their return?

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4. Was the feedback you received from your correspondence or distance learning teacher helpful?

☐ Yes      ☐ No      Please comment.

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Thanks for taking the time to complete this survey. Your feedback is important to us. If you are mailing this survey, please use the address on the right. Or, you may e-mail or fax the survey, using the address or number below.

Learning Technologies Branch  
Box 4000  
Barrhead, Alberta  
T7N 1P4

E-mail: [ltbgeneral@gov.ab.ca](mailto:ltbgeneral@gov.ab.ca)  
Fax: (780) 674-6561

If you are enrolled at the Alberta Distance Learning Centre and will be mailing your Assignment Booklets to ADLC, you may return this survey with the final Assignment Booklet in the course.